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09/992,677	11/14/2001	Srinivasan Venkatachary	103001-1	5860

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EXAMINER

NGUYEN, PHUONGCHAU BA

ART UNIT	PAPER NUMBER
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2665

DATE MAILED: 01/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/992,677

Applicant(s)

VENKATACHARY ET AL

Examiner

Phuongchau Ba Nguyen

Art Unit

2665

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 November 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>11-14-1</u> . | 6) <input type="checkbox"/> Other: _____ |

Claim Objections

1. Claim 16 is objected to because of the following informalities: "each" should be deleted from line 3. Appropriate correction is required.

Claim Rejections – 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 16, 22–23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 16, the limitation "each said at least one sub-database"(line 3, claim 16) is vague because the previous mention of "said memory comprising at least one sub-database", thus constituted antecedent basis to the limitation of "each said at least one sub-database" as if there is only one sub-database in the memory.

Regarding claims 22–23, please define P (claim 22, line 3) and S (claim 23, line 3).

Claim Rejections – 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this

Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1–4, 13–21 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta (Packet Classification on Multiple Fields).

Regarding claim 1,

Gupta (Packet Classification on Multiple Fields) discloses a Packet Matching method, the method comprising:

(a) providing a Rule Database (CAM) comprising a plurality of classification rules (matching rules), and providing a packet comprising a packet header to be classified (5th paragraph, page 1, and 4–Previous Work);

(b) creating a plurality of sub-databases (tables) from the plurality of classification rules (matching rules) in the Rule Database (4-Previous Work);

(c) creating a plurality of Necessary Path Condition Rules (matching rules) wherein each Necessary Path Condition Rule (a matching rule) corresponds to a sub-database (table)(tables 1-2, 1-introduction; 2-The problem of Packet Classification; 4-Previous Work);

(d) determining which sub-databases (table) to search, said determining further comprising comparing at least some of the packet header to the plurality of Necessary Path Condition Rules (1-Introduction; 2-The problem of Packet Classification; 4-Previous Work);

(e) searching the sub-databases determined in step (d) for best matching classification rules (1-Introduction; 2-The problem of Packet Classification; 4-Previous Work); and

(f) selecting the best matching classification rule (1-Introduction; 2-The problem of Packet Classification; 4-Previous Work).

Regarding claim 2,

Gupta further discloses wherein the searching in (e) comprises searching in parallel (4–Previous Work).

Regarding claim 3,

Gupta further discloses (g) providing an additional packet to be classified; and (h) matching the additional packet according to steps (d), (e), and (f) (i.e., the header of each packet is examined to identify the flow to which the packet belongs in 1–Introduction; see also 2–The problem of Packet Classification; 4–Previous Work).

Regarding claim 4,

Gupta further discloses wherein the sub-databases comprise at least $T/3$ classification rules, and wherein the sub-databases further comprise up to T classification rules (2.1–Examples of a Classifier, number 2).

Regarding claim 13,

Gupta (Packet Classification on Multiple Fields) discloses a Packet Matching system, the system comprising:

an All Matching Rules Engine (router, 3rd paragraph, page 1) capable of receiving a packet header (3rd paragraph);

a plurality of Best Matching Rules Sub-Engines (ISP, 3rd–4th paragraphs, page 1) coupled to said All Matching Rules Engine (router); and

a Collate Engine (NAP, 3rd–4th paragraphs, page 1) coupled to said Best Matching Rules sub-engines.

Regarding claim 14, Gupta (Packet Classification on Multiple Fields) discloses wherein said All Matching Rules Engine (router) further comprises a memory comprising a set of Necessary Path Condition Rules (tables 1–3, 2–The Problem of Packet Classification & 2.1–Example of a Classifier).

Regarding claim 15, Gupta (Packet Classification on Multiple Fields) discloses said memory comprising at least one of the following memories: CAM, DRAM, SRAM (CAM, 4-Previous Work).

Regarding claim 16, Gupta (Packet Classification on Multiple Fields) discloses wherein each of the plurality of said Best Matching Rules sub-engine (ISP, fig.1) further comprises a memory (CAM, 4-Previous Work), said memory comprising at least one sub-database (tables, 4-Previous Work), each said at least one sub-database corresponding to said Necessary Path Condition Rules (example of rules, table 1).

Regarding claim 17, Gupta (Packet Classification on Multiple Fields) discloses wherein said memory comprises at least one of the following memories: CAM, DRAM, SRAM (CAM, 4-Previous Work).

Regarding claim 18, Gupta (Packet Classification on Multiple Fields) discloses wherein said at least one sub-database (table, 4-Previous Work) comprises a plurality of rules (matching rule, 4-Previous Rule).

Regarding claim 19, Gupta (Packet Classification on Multiple Fields) discloses wherein said at least one sub-database (table, 4-Previous Work) comprises a plurality of forwarding entries (entries in table, 4-Previous Work).

Regarding claim 20, Gupta (Packet Classification on Multiple Fields) discloses wherein said plurality of Best Matching Rules sub-Engines (ISP, fig.1) further comprises a plurality of sub-databases (tables), wherein each sub-database of said plurality of sub-databases corresponds to one of said Necessary Path Condition Rules (matching rules, 4-Previous Work), wherein said plurality of sub-databases are distributed among said plurality of Best Matching Rules sub-engines such that concurrent activation of more than one Best Matching Rules

sub-Engine of said plurality of sub-engines is minimized (5th paragraph, page 1).

Regarding claim 21,

Gupta (Packet Classification on Multiple Fields) discloses a Packet

Matching system comprising:

means for creating a plurality of sub-databases from a plurality of rules (table 2);

means for determining which sub-databases to search given a packet (table 2 and 2nd paragraph on page 1);

means for finding best rule matches among the determined sub-databases for the packet (1st paragraph, page 2); and

means for selecting the highest priority best matching rule from among the found best rule matches (5th paragraph page 1).

6. Claims 5–10 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta (Packet Classification using Hierarchical Intelligent Cuttings).

Regarding claim 5,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings)

discloses a method for organizing a Rule Database, the method comprising:

(a) providing a Rule Database (Ternary CAM) comprising a plurality of N classification rules, each classification rule comprising W bits, wherein each bit of the W bits has a value selected from the group consisting of 0, 1, and X (3–Related Work);

(b) constructing a hierarchical subdivision tree (fig.5), comprising a single root, a plurality of nodes, and a plurality of leaves, wherein the root, the nodes, and the leaves are interconnected by a plurality of branches, wherein each branch corresponds to a value of a bit of the W bits of at least some of the plurality of the N classification rules (fig.2, 4–Packet Classification using Hierarchical Intelligent Cutting); and

(c) creating a plurality of sub-databases such that traversing, via at least some of the branches, any path from the root of the hierarchical subdivision tree through at least some of the interconnected nodes to a leaf of the plurality of leaves will lead to a sub-database, wherein each sub-database comprises a subset of up to T classification rules (subset of rules $R(u)$) of the plurality of N classification rules (set of rules $R(v)$), and wherein each of the plurality of the N classification rules is a member of exactly one sub-database (fig.2, 4-Packet Classification using Hierarchical Intelligent Cutting).

Regarding claim 6,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings) discloses wherein each sub-database further comprises a subset of at least T_{min} classification rules (subset of rules $R(u)$) of the plurality of N classification rules (set of rules $R(v)$) (fig.2, 4-Packet Classification using Hierarchical Intelligent Cuttings).

Regarding claim 7,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings)

discloses wherein T_{min} is less than or equal to $T/3$ (table 1, 4-Packet Classification using Hierarchical Intelligent Cuttings).

Regarding claim 8,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings)

discloses creating a plurality of Necessary Path Condition Rules wherein each of the Necessary Path Condition Rules corresponds to a sub-database, and wherein each of the Necessary Path Condition Rules of the plurality of the Necessary Path Condition Rules is comprised of the bit values associated with each traversed branch of the hierarchical subdivision tree while traversing the hierarchical subdivision tree from the root to the corresponding exactly one sub-database (fig.2, 4-Packet Classification using Hierarchical Intelligent Cuttings).

Regarding claim 9,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings)

discloses wherein N is at least around 10,000 (3-Related Work, 9th paragraph).

Regarding claim 10,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings)

discloses wherein W is at least around 32 (table 1).

Claim Rejections – 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 11–12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta (Packet Classification using Hierarchical Intelligent Cuttings) in view of Liu (Reducing Routing Table Size Using Ternary CAM).

Regarding claim 11,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings) all the claimed limitations, except (1) inserting an additional rule to a sub-database.

However, in the same field of endeavor, Liu (Reducing Routing Table Size Using Ternary CAM) discloses 3.1–Insertion (corresponding to (1)). Therefore, it would have been obvious to an artisan to apply Liu's teaching to Gupta's system with the motivation being to reduce the compaction ratio over time, results in almost no area savings at all.

Regarding claim 12,

Gupta (Packet Classification using Hierarchical Intelligent Cuttings) all the claimed limitations, except (1) deleting an existing rule from a sub-database.

However, in the same field of endeavor, Liu (Reducing Routing Table Size Using Ternary CAM) discloses 3.2-Withdrawal (corresponding to (1)).

Therefore, it would have been obvious to an artisan to apply Liu's teaching to Gupta's system with the motivation being to reduce the table size.

9. Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta (Packet Classification on Multiple Fields) in view of Liu (Reducing Routing Table Size Using Ternary-CAM).

Regarding claim 22,

Gupta discloses all the claimed limitations, except (1) an optimizing means for creating the plurality of sub-databases such that power dissipation is less than P.

However, in the same field of endeavor, Liu (Reducing Routing Table Size Using Ternary-CAM) discloses in the 6th paragraph for creating a compact routing table size so that a smaller number of CAM chips can be used in the system (corresponding to (1)). Therefore, it would have been obvious to an

artisan to apply Liu's teaching to Gupta's system with the motivation being to reduce its power consumption and heat dissipation.

Regarding claim 23,

Gupta discloses all the claimed limitations, except (1) an optimizing means for creating the plurality of sub-databases such that storage requirements of each sub-database of the plurality of sub-databases is less than S.

However, in the same field of endeavor, Liu (Reducing Routing Table Size Using Ternary-CAM) discloses in the 4-5th paragraphs for creating compact routing table to store separate mask for each entry and to store prefix with different length into separate CAM chip (see table 1). Therefore, it would have been obvious to apply Liu's teaching to Gupta's system with the motivation being to provide a high lookup throughput.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Phuongchau Ba Nguyen whose telephone number is 571-272-3148. The examiner can normally be reached on Monday-Friday from 10:00 a.m. to 2:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Application/Control
Number: 09/992,677
Art Unit: 2665

Page 18



Phuongchau Ba Nguyen
Examiner
Art Unit 2665

**DUCHO
PRIMARY EXAMINER**



1-13-06